What Is Claimed Is:

1. A method for forming a transparent rare earth garnet ceramic having a precise earth-alumina ratio and having the chemical composition $(G_{1-x-y}A_xRe_y)_wD_zO_{12}$, where G is at least one metal selected from the group consisting of Tb and Lu; A is at least one rare earth metal selected from the group of Y, La, Gd, Lu and Yb when G is Tb; A is at least one rare earth metal selected from the group of Y, La, Gd, Tb and Yb when G is Lu; Re is at least one rare earth metal selected from the group consisting of Ce, Pr, Nd, Sm, Eu, Dy, Ho, Er, and Tm; D is at least one metal selected from the group consisting of Al, Ga, and In; w is a range from about 2.8 up to about and including 3.1%; x is in the range from 0 to about and including 0.5%; y is in the range from 0.0005 to about and including 0.2%; and z is in the range from 4.0 to about and including 5; the method comprising:

forming an ammonium rare earth double oxalate precipitate;

washing and drying said ammonium rare earth double oxalate precipitate;

calcining said ammonium rare earth double oxalate precipitate;

mixing a first quantity of said ammonium rare earth double oxalate precipitate with a second quantity of aluminum oxide to form a mixture having the precise earth-alumina ratio;

milling said mixture to a desired particle size;

compacting said milled mixture to form a powder compact;

sintering said powder compact to form a perovskite and other intermediate compounds;

heating said perovskite and other intermediate compounds at between 900 and 1100 degrees Celsius to form a garnet; and

sintering said garnet at a temperature between approximately 1700 and 1800 degrees Celsius.

2. The method of claim 1, wherein forming a ammonium rare earth double oxalate precipitate comprises:

introducing an aqueous solution of soluble rare earth compounds to an ammonium hydroxide solution to form a rare earth hydroxide gelatinous precipitate; and

reducing the pH of said rare earth oxide gelatinous precipitate to about 4.0 by introducing a first amount of oxalic acid solution to said rare earth hydroxide gelatinous precipitate.

3. The method of claim 1, wherein calcining said rare earth oxide precipitate comprises calcining said rare earth oxide precipitate at between approximately 700 and 800 degrees Celsius.

4. The method of claim 1, wherein milling said mixture comprising dry milling said mixture to a desired particle size.

5. The method of claim 1, wherein milling said mixture comprises:

introducing a low surface tension liquid to said mixture; and

wet milling said mixture to a desired particle size.

6. The method of claim 5, wherein said low surface tension liquid comprises a low surface tension alkane.

7. The method of claim 5, wherein said low surface tension liquid comprises a low surface tension alcohol.

8. The method of claim 1, wherein compacting said milled mixture comprises dry pressing said milled mixture to form a powder compact.

9. The method of claim 1, wherein sintering said garnet comprises:

sintering said garnet comprises sintering said garnet at between approximately 1700 and 1800 degrees Celsius in an oxygen atmosphere.

10. The method of claim 1, wherein sintering said garnet comprises:

sintering said garnet comprises sintering said garnet at between approximately 1700 and 1800 degrees Celsius in a vacuum to form the transparent rare earth garnet ceramic and an oxygen deficient garnet; and

introducing said oxygen deficient garnet to an oxygen atmosphere above 1000 degrees Celsius to form an additional amount of the transparent rare earth garnet ceramic.

11. The method of claim 1, wherein sintering said garnet comprises:

sintering said garnet comprises sintering said garnet at between approximately 1700 and 1800 degrees Celsius in a wet hydrogen gas atmosphere to form an oxygen deficient transparent rare earth garnet ceramic; and

introducing said oxygen deficient garnet to an oxygen atmosphere above 1000 degrees Celsius to form an additional amount of the transparent rare earth garnet ceramic.

12. The method of claim 1, wherein the earth-alumina ratio of the transparent rare earth garnet ceramic is approximately 0.6/1.

13. The method of claim 4, wherein milling said mixture comprising dry milling said mixture with a rare earth garnet grinding media to a desired particle size.

14. The method of claim 4, wherein said rare earth garnet grinding media comprises yttrium aluminum garnet.

15. The method of claim 4, wherein milling said mixture comprising dry milling said mixture with an alumina oxide grinding media to a desired particle size.

16. The method of claim 15, wherein a third quantity of said ammonium rare earth double oxalate precipitate is added to said mixture to maintain the precise earth-alumina ratio, said third quantity being a function of the predetermined wear characteristics of said alumina oxide grinding media during said milling of said mixture.

17. The method of claim 4, wherein milling said mixture comprises

dry milling said mixture with a grinding media to a desired particle size; and

removing said grinding media from said milled mixture prior to compacting said milled mixture.

18. The method of claim 17, wherein removing said grinding media comprises burning said grinding media out of said milled mixture prior to compacting said milled mixture.

19. The method of claim 17, wherein removing said grinding media comprises subliming said grinding

media out of said milled mixture prior to compacting said milled mixture.

20. The method of claim 17, wherein removing said grinding media comprises dissolving said grinding media out of said milled mixture prior to compacting said milled mixture.